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(54) VIDEO SIGNAL RECORDER AND VIDEO SIGNAL REPRODUCER

(57)Abstract:

PROBLEM TO BE SOLVED: To readily execute slow motion reproduction or high-speed motion reproduction by obtaining a desired frame rate at reproduction, by having information related to a frame rate recorded at recording and a video signal.

SOLUTION: A video signal is recorded at a prescribed rate by an m-fold speed frame rate imaging unit, and both the video signal and conversion information, such as rate information directly or indirectly indicating the frame rate at the time of recording are recorded, and the reproducing speed adjustment or rate conversion of the video signal is automatically executed, based on the conversion information reproduced at reproduction.

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CLAIMS

[Claim(s)]

[Claim 1] The video-signal recording device characterized by recording the rate information which expresses the frame rate of said input video signal directly or indirectly with said input video signal when recording the input video signal of the mX frame rate of the standard frame rate of a record format on a record medium in the format which maintained the aforementioned record format per frame.

[Claim 2] The rate information which expresses directly or indirectly the frame rate of the input video signal of the mX frame rate of the standard frame rate of a record format and said input video signal From the record medium currently recorded in the format which maintained the aforementioned record format per frame The video-signal regenerative apparatus characterized by carrying out the playback output of said input video signal by predetermined **** of the reproduction speed which becomes settled for said rate information when reproducing said input video signal and said rate information and reproducing said input video signal by different frame rate from said standard frame rate.

[Claim 3] The video-signal recording device which carries out frame rate conversion of the frame rate of said video signal A at said standard frame rate, and is characterized by acquiring a video signal B and recording said video

signal B and conversion information on said frame rate conversion when recording the video signal A of the mX frame rate of the standard frame rate of a record format.

[Claim 4] Conversion information is a video-signal recording device according to claim 3 characterized by the contents of a signal of a video signal B consisting of rate information which shows the frame rate of a video signal A directly or indirectly with the conversion flag which shows directly or indirectly the location of the point of changing by inter-frame, or an effective frame, or said conversion flag.

[Claim 5] The video-signal regenerative apparatus characterized by to reproduce said video signal B and said conversion information, to change said video signal B into the video signal of a twice [predetermined] as many frame rate as said video signal A, and to carry out a playback output using said conversion information from the record medium with which the video signal B which carried out frame rate conversion of the frame rate of the video signal A of the mX frame rate of the standard frame rate of a record format at said standard frame rate, and the conversion information on said frame rate conversion were recorded.

[Claim 6] Conversion information is a video-signal regenerative apparatus according to claim 5 characterized by the contents of a signal of a video signal B consisting of rate information which shows the frame rate of a video signal A

directly or indirectly with the conversion flag which shows directly or indirectly the location of the point of changing by inter-frame, or an effective frame, or said conversion flag.

[Claim 7] The video signal B which carried out frame rate conversion of the video signal A of the mX frame rate of the standard frame rate of a record format at the frame rate of said criterion From the record medium with which the conversion information whose contents of a signal of said video signal B are only the conversion flags which show directly or indirectly the location of the point of changing by inter-frame, or an effective frame was recorded Reproduce said video signal B and said conversion information, and the information which shows the frame rate at the time of record of said video signal A from the appearance pattern of said conversion flag is detected. The video-signal regenerative apparatus characterized by changing said video signal B into the video signal of a twice [predetermined] as many frame rate as said video signal A, and carrying out a playback output using said information.

[Claim 8] The video-signal recording device according to claim 1 or 3 characterized by the standard frame rate of a record format being 24Hz.

[Claim 9] The video-signal regenerative apparatus according to claim 2, 5, or 7 characterized by a record format standard frame rate being 24Hz.

[Claim 10] The video-signal recording device according to claim 3 characterized

by a record format standard frame rate being 60Hz.

[Claim 11] The video-signal regenerative apparatus according to claim 5 or 7 characterized by a record format standard frame rate being 60Hz.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] About the video-signal processing system which is not a film, and shoots and processes a movie electronically, this invention changes especially the frame rate (frame number per second) of a video signal, picturizes and records it with a camera etc., and relates to the record regenerative apparatus which acquires slow motion and the high speed motion effectiveness in a playback image by outputting by making it a predetermined frame rate at the time of playback.

[0002]

[Description of the Prior Art] In recent years, to semiconductor technology, computer technology, and a pan, small, high definition, and high performance-ization of a broadcast device system improved by leaps and

bounds by progress of a high density record technique. Consequently, the motion which makes the movie on which photography and edit were performed with the film by the electronic cinema system using VTR or the non-linear-editing machine of the computer base has activated conventionally. Also in the electronic cinema system, it is the same 24 coma / second as a film, and correspondence-ization to 24P signal (progressive signal whose frame rate is 24Hz) which moreover transmits one like an NTSC television signal method not per interlace which divides and transmits to the two fields but per frame (progressive method) is advance so that a vast quantity of property and facilities of film producing industry can be divert as they are.

[0003] The example of the electronic cinema structure of a system which is the conventional video-signal record regenerative apparatus is shown in drawing 9 . Moreover, drawing 10 is the signal wave form conceptual diagram of each part in the conventional example. In drawing 10 , A, B, C, and D correspond to the signal A in drawing 9 , B.C, and D, respectively, and F1, F2, and -- show the video signal of one frame, respectively.

[0004] The conventional electronic cinema system constituted as mentioned above is explained using drawing 9 and drawing 10 .

[0005] If the recorder 103 and the regenerator 105 support 24P signal record playback when the image pick-up machine 901 picturizes by 24P signal, as

shown in drawing 10 (a), the record playback of the 24P signal can be carried out as it is, without performing frame rate conversion etc. As for 24P signal reproduced after edit processing, one frame of a video signal can be burned on one coma of a film as it is with kinescope recording (KINEKO) equipment.

[0006] When the image pick-up machine 901 and a recorder 103, and a regenerator 104 are 60P signal (progressive signal whose frame rate is 60Hz) correspondences which made the frame rate of for example, a present SD television signal method or HD television signal method the twice as many progressive signal as this, as generally shown in drawing 10 (b), in a regenerator 105, it is made 24P signal by extracting periodically the frame in the middle of a continuous frame, and can be burned on a film.

[0007] Furthermore, it becomes indispensable that the high speed motion obtained by the slow motion obtained by making a film beforehand more nearly high-speed than usual in order to transpose to the electric video recording according filmin to a video camera, VTR, or a hard disk drive unit, taking a photograph, and usually making it into a rate at the time of projection, and making a film into slow speed conversely more nearly beforehand than usual, taking a photograph, and usually making it into a rate at the time of projection is realizable.

[0008] To this request, it is controlling the CCD (Charge Coupled Device) drive

approach of the image pick-up section, and the image pick-up equipment corresponding to the multi-framing rate which can set the frame rate at the time of an image pick-up as any value is devised.

[0009]

[Problem(s) to be Solved by the Invention] However, it sets to the above-mentioned conventional cinema signal photography system. It records by the frame rate of 48P (progressive signal whose frame rate is 48Hz). Reproduce by 24P or As [reproduce / by 24P / record by the frame rate of 12P (progressive signal whose frame rate is 12Hz), and] In the case of VTR, can perform easily implementation of the slow motion in a simple ratio, or a high speed motion by setting the jog dial for special playback as 1/2X or 2X by the manual, and reproducing at the time of playback, but For example, the ship gathers and photos the film rate slightly beforehand in photography of the scene which navigates on [the sea] using the ship of a miniature, and it is usually made a rate at the time of playback. More a motion of a ship a feeling of weight as it is, in order to show or to show a motion of a boxing scene more violently conversely The film rate is reduced and photoed slightly beforehand, it is usually made a rate at the time of playback, and an actor's action is made quick to extent without sense of incongruity, In a jog dial setup of VTR by the manual, when it is going to perform finer speed control, since a setting rate is not continuation adjustable, it

cannot adjust to the predetermined rate to wish, or the case where the precision of reproduction speed is not acquired arises.

[0010] This invention solves the above-mentioned technical problem, and aims at obtaining a desired frame rate and enabling it to perform easily slow motion playback and high speed motion playback at the time of playback by recording the information about the frame rate at the time of record with a video signal.

[0011]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, this invention makes a frame rate what X at the time of record, records the rate information which shows whether it picturized and recorded on a record medium on the video signal and coincidence to record, acquires the rate information at the time of record at the time of playback, and sets it to predetermined reproduction speed.

[0012]

[Embodiment of the Invention] When recording the input video signal of the mX frame rate of the standard frame rate of a record format on a record medium in the format which maintained the aforementioned record format per frame, invention of the 1st of this invention with said input video signal It is the video-signal recording device characterized by recording the rate information which expresses the frame rate of said input video signal directly or indirectly,

and the rate information at the time of record can be acquired at the time of playback by recording rate information on a record medium with the video signal to record.

[0013] The rate information which expresses directly or indirectly the frame rate of the input video signal of the mX frame rate of the standard frame rate of a record format and said input video signal invention of the 2nd of this invention From the record medium currently recorded in the format which maintained the aforementioned record format per frame When said input video signal and said rate information are reproduced and said input video signal is reproduced by different frame rate from said standard frame rate, It is the video-signal regenerative apparatus characterized by carrying out the playback output of said input video signal by predetermined **** of the reproduction speed which becomes settled for said rate information, and a setup to predetermined reproduction speed becomes easy using the reproduced rate information.

[0014] When invention of the 3rd of this invention records the video signal A of the mX frame rate of the standard frame rate of a record format, Carry out frame rate conversion of the frame rate of said video signal A at said standard frame rate, and a video signal B is acquired. It is the video-signal recording device characterized by recording said video signal B and conversion information on said frame rate conversion, and the conversion information at the time of record

can be acquired by recording conversion information with the video signal to record at the time of playback.

[0015] The video signal B with which invention of the 4th of this invention carried out frame rate conversion of the frame rate of the video signal A of the mX frame rate of the standard frame rate of a record format at said standard frame rate From the record medium with which the conversion information on said frame rate conversion was recorded, said video signal B and said conversion information are reproduced. It is the video-signal regenerative apparatus characterized by changing said video signal B into the video signal of a twice [predetermined] as many frame rate as said video signal A, and carrying out a playback output using said conversion information, and a reproduction speed setup and a rate conversion ratio setup can be automatically performed using the reproduced conversion information.

[0016] The video signal B with which invention of the 5th of this invention carried out frame rate conversion of the video signal A of the mX frame rate of the standard frame rate of a record format at the frame rate of said criterion From the record medium with which the conversion information whose contents of a signal of said video signal B are only the conversion flags which show directly or indirectly the location of the point of changing by inter-frame, or an effective frame was recorded Reproduce said video signal B and said conversion

information, and the information which shows the frame rate at the time of record of said video signal A from the appearance pattern of said conversion flag is detected. Since it is the video-signal regenerative apparatus characterized by changing said video signal B into the video signal of a twice [predetermined] as many frame rate as said video signal A, and carrying out a playback output using said information and rate information can be detected from a repeat flag A reproduction speed setup and a rate conversion ratio setup can be performed automatically.

[0017] Hereafter, from drawing 1 to drawing 8 is used and explained about the gestalt of operation of this invention.

[0018] (Gestalt 1 of operation) Drawing 1 is the block diagram showing the configuration of the video-signal record regenerative apparatus with which one example of the video-signal recording device of invention of this application 1st and one example of the video-signal regenerative apparatus of invention of this application 2nd were combined.

[0019] The mX frame rate image pick-up machine which can picturize 101 by the mX (m> 0) frame rate compared with the standard frame rate (frame number around for 1 second) of a record format, and can output the signal in drawing 1 , The rate information input terminal into which 102 inputs rate information, the recorder which 103 changes into recording information the rate information

inputted from the video signal picturized with the mX frame rate image pick-up vessel 101, and the rate information input terminal 102, and is recorded on a record medium 104, The regenerator with which 105 reproduces a video signal and rate information from a record medium 104, The actuation information input terminal into which 106 inputs actuation information, the actuation controller which operates a regenerator 105 according to the actuation information as which 107 is inputted from the actuation information input terminal 106, and the rate information acquired from a regenerator 105, and 108 are output terminals which output a playback video signal.

[0020] About the video-signal record regenerative apparatus constituted as mentioned above, the actuation is explained below.

[0021] In the gestalt of this operation, the case where the frame rate of a record format is 24Hz is explained as a standard frame rate. Moreover, the video-signal format to record is made into the progressive video-signal format which makes one frame the unit of record and a display. Moreover, about the part which performs record and playback, the record reproducing head is carried on a rotating cylinder, and VTR which carries out the helical scan of the record reproducing head, and carries out information record on a magnetic tape is assumed.

[0022] When carrying out record playback by the standard frame rate (standard

speed), the rate information (here, a standard frame rate shall be expressed with m of the relative rate at the time of being referred to as 1) that a frame rate is expressed directly or indirectly is inputted from the rate information input terminal 102, and according to the rate information, the mX frame rate image pick-up machine 101 picturizes as m= 1, and outputs the image information on 24P (a frame rate is 24Hz). A recorder 103 changes the image information output from the mX frame rate image pick-up machine 101, and the rate information from the rate information input terminal 102 into the recording information for recording on a record medium 104, and carries out sequential record at a record medium 104.

[0023] Conversion of the image information on a recorder 103, and the record to a record medium 104 for example, DV (SMPTE -- 314 specification) which is generally the digital video tape recorder broadly used from the noncommercial way to the object for broadcasting service If SMPTE:Society of Motion Picture and Television Engineers is taken for an example Shuffling which rearranges sequence for the image information on one frame per predetermined pixel block is performed. Next, high efficiency coding which reduces amount of information to the specified quantity per predetermined pixel block, Error correcting code-ization which adds the redundancy data for an error correction beforehand in order to prevent lack of image information data etc. arising and an error occurring at the time of playback is performed. After performing channel coding

changed into the sign which can furthermore be efficiently recorded on a magnetic tape, it is equivalent to a series of processings in which it records by performing helical scan on a magnetic tape through record amplifier and a recording head.

[0024] The magnetic tape feed rate which is the helical scan rotational frequency and record medium 104 of the record reproducing head is adjusted, and recorder 103 output is recorded on a record medium 104 in a cycle of 24Hz at the same time it performs processing of input image information and rate information with the recorder 103 in the gestalt of this operation at this time, as described above. In the case of the gestalt of this operation, the rate information from the rate information input terminal 102 shall be beforehand stored in the predetermined location of the recording information outputted from a recorder 103. Although it is good anywhere as a storing location of rate information at the time of playback if it is the location whose rate information is the need surely again and which can be taken out timely by the way, for example in the DV format VTR, how to store in the you ZAZU bit pack of the time code in a sub-code etc. can be considered. Although order contrary to the time of record is followed and a playback video signal is acquired from a record medium 104 in a regenerator 105 at the time of playback, the rate information stored in coincidence in the predetermined location of a playback video signal is taken out,

and it inputs into the actuation controller 107.

[0025] A regenerator 105 is controlled by the actuation controller 107 based on the actuation information from the actuation information input terminal 106, and the rate information acquired from a regenerator 105, and the playback video signal of a predetermined frame rate is acquired from an output terminal 108. The input from the actuation information input terminal 106 is equivalent to a reproduction speed setup by the operator etc. For example, with the actuation controller 107, if the actuation information from the actuation information input terminal 106 is directing playback by the standard frame rate, since the inputted rate information is m= 1, the helical scan rotational frequency of the record reproducing head in a regenerator 105 and the feed rate of a magnetic tape will be adjusted, and recording information will be reproduced from a record medium 104 in a cycle of 24Hz.

[0026] Next, a frame rate 30Hz video signal is recorded, and the case of the slow motion image work which performs slow playback 4/5 time, and acquires a frame rate 24Hz signal is described. In this case, the rate information from the rate information input terminal 102 is set up with m=5/4, it picturizes with the mX frame rate image pick-up vessel 101 by 24x5 / 4= 30Hz frame rate, and image information and rate information are recorded on a record medium 104 with a recorder 103 like the time of the record playback by the standard frame rate.

However, the helical scan rotational frequency in a recorder 103 and the feed rate of a magnetic tape also perform signal record on a record medium 104 as 24x5 / 4= 30Hz at this time.

[0027] The record video-signal wave conceptual diagram of m=5/4 is shown in drawing 2 (a). As shown in drawing 2 (a), one frame is a second (1/30), and F1, F2, and -- show one frame, respectively.

[0028] Although image information and rate information as well as the case of the record playback by the standard frame rate are reproduced also at the time of playback If the actuation information from the actuation information input terminal 106 is directing playback by the standard frame rate (24Hz), for example, in the actuation controller 107 The helical scan rotational frequency of the record reproducing head in a regenerator 105 and the feed rate of a magnetic tape are adjusted. Recording information is reproduced from a record medium 104 in a cycle of [which is a standard frame rate] 24Hz, a playback video signal is acquired with procedure contrary to the time of record with a regenerator 105, and it outputs from an output terminal 108. At this time, a playback video signal serves as a 4/5X slow motion image at the time of record. The playback video-signal wave conceptual diagram when reproducing by the standard frame rate to drawing 2 (b) is shown. As shown in drawing 2 (b), one frame is a second (1/24), and F1, F2, and -- show one frame, respectively.

[0029] Since the rate information at the time of the record taken out with the regenerator 105 (m=5/4) is acquired by the actuation controller 107, to it, it can recognize easily only from the playback information from a record medium 104 that the 4/5X slow motion image will be acquired if it reproduces in a cycle of 24Hz.

[0030] On the other hand, for example, when it sets up so that it may reproduce by the same frame rate as the time of record (motion rate) for the actuation information from the actuation information input terminal 106, Since playback rate information is m=5/4, by the control information from the actuation controller 107 It carries out regulating automatically of the helical scan rotational frequency of the record reproducing head and the feed rate of a magnetic tape in a regenerator 105, it sets up so that recording information may be reproduced from a record medium 104 24x5 / in a cycle of 4= 30Hz, and playback by the same frame rate as the time of record can be performed.

[0031] As explained above, a frame rate is made into what X at the time of record, by recording the rate information which shows whether it picturized and recorded on a record medium on the video signal to record and coincidence, the rate information at the time of record is acquired by coincidence at the time of playback, and a setup to predetermined reproduction speed becomes easy.

[0032] In addition, although the gestalt of this operation explained the case

where a slow motion image was acquired by picturizing at high speed beforehand and considering as a standard frame rate at the time of playback, it picturizes at slow speed beforehand, and it can realize easily, without the same being said of the case where a high speed motion is obtained by considering as a standard frame rate at the time of playback, and performing a fine manual setup with the same procedure also with the case of other speed.

[0033] Moreover, although carried out to the m itself which shows the frame rate at the time of record of as opposed to a standard frame rate for rate information, as long as the relative frequency relation to a standard frame rate is shown, what kind of thing may be used.

[0034] Moreover, at the time of playback, although it said that there is a method of storing rate information in the you ZAZU bit pack of the time code in a sub-code, as long as it is the location which is the need and which can be taken out timely by the way, you may store anywhere.

[0035] Moreover, although recorded on a record medium 104 with the same frame frequency as the record video-signal frame rate set up for rate information, n (n= 1, 2, ...) division of the information in one frame may be done, and you may record and reproduce by the frame rate n times the frequency of a record video signal.

[0036] In addition, in the gestalt of this operation, although the standard frame

rate of a record format was set to 24Hz, even if it is the other frame rate value, there is no change in the effectiveness of the gestalt of this operation.

[0037] (Gestalt 2 of operation) Drawing 3 is the block diagram showing the configuration of the video-signal record regenerative apparatus with which one example of the video-signal recording device of invention of this application 3rd and one example of the video-signal regenerative apparatus of invention of this application 4th were combined. In drawing 3 , the same sign is given to the block which performs the same actuation as the video-signal record regenerative apparatus in the gestalt 1 of operation, and explanation is omitted.

[0038] In drawing 3 , the record rate converter which 201 carries out rate conversion of the video signal A picturized with the mX frame rate image pick-up vessel 101 according to the rate information 102, and outputs the video signal B which carried out rate conversion, and conversion information, and 202 are the playback rate converters which change the playback rate of the playback video signal B according to the playback video signal B and the conversion information which were reproduced by the regenerator 105, and control of the actuation controller 106.

[0039] About the video-signal record regenerative apparatus constituted as mentioned above, the actuation is explained below.

[0040] The gestalt of this operation explains the case where the frame rate of a

record format is 60Hz, as a standard frame rate. A video-signal format is made into the progressive video-signal format which makes one frame the unit of record and a display. Furthermore, a recorder 103 is changed and recorded on frame rate 60Hz by the record rate converter 201, when not recording the video signal of a frame rate 60Hz signal format by standard speed and recording the input signal whose frame rate is not 60Hz. Moreover, about the part which performs record and playback, VTR which carries out the helical scan of the record reproducing head, and carries out information record on a magnetic tape is assumed.

[0041] First, when picturizing in frame rate 24Hz and recording in standard frame rate 60Hz of a record format, the rate information that a frame rate is expressed directly or indirectly is inputted from the rate information input terminal 102, and according to the rate information, the mX frame rate image pick-up machine 101 picturizes as m=24/60=2/5, and outputs 24Hz image information (the video signal A of drawing 3). Let rate information be the value of the m itself with the gestalt of this operation.

[0042] In the record rate converter 201, rate conversion is performed based on the rate information into which the video signal A inputted from the mX frame rate image pick-up machine 101 was inputted from the rate information input terminal 102, and a video signal B is acquired and outputted. The record of the

video-signal record regenerative apparatus of the gestalt of this operation at the time of frame rate photography, a playback video-signal wave, and a conversion information wave conceptual diagram are usually shown in drawing 4 . In the case of the gestalt of this operation, the record frame rate 60Hz video signal B is acquired by performing actuation which one frame repeats the video signal of a second (1/24) periodically, and inserts it as opposed to the video signal A shown in drawing 4 (a), as shown in drawing 4 (b), and outputting one frame in a second (1/60).

[0043] About the frame number conversion approach for setting the frame rate of an output video signal (video signal B) to standard 60Hz for a record format by the record rate converter 201, in the case of m=2/5, it specifically sets up so that frame number conversion may be shown in 1/m=5 / 2 (b), i.e., drawing 4 , and five frames may be outputted within the two-frame period of an input video signal (video signal A). This repeats the odd-numbered frame in a cycle of [of the video signal (video signal A) inputted, for example] 24Hz 3 times, the even-numbered frame is repeated twice, it is outputting one frame in 1 / 60 seconds, and a 60Hz frame rate will be obtained.

[0044] The record rate converter 201 outputs the repeat flag (drawing 4 (c)) which is a conversion flag which shows the location where the contents of a video signal of order changed by inter-frame [of the image frame continuously

outputted in a video signal B], and rate information (m=2/5) to the next step as conversion information at the same time it outputs a video signal B. A repeat flag shall assign 1-bit information like a value 1 to the frame (F3 in drawing 4 (b)) of a value 0 and the same contents of a video signal which follow the degree further to the frame (F2 in drawing 4 (b)) of a value 1 and the same contents of a video signal following the degree to the frame (F1 in drawing 4 (b)) of the same contents of a video signal.

[0045] A recorder 103 changes the video signal B and conversion information from the record rate converter 201 into the recording information for recording on a record medium 104, and carries out sequential record at a record medium 104. Let conversion of the image information on a recorder 103, and record to a record medium 104 be the same approaches as the gestalt 1 of operation of this invention described. Moreover, suppose that it is the same as that of the case of the rate information in the gestalt 1 of operation of this invention also about the storing approach of conversion information.

[0046] At the time of playback, the information recorded on the record medium 104 by the regenerator 105 is reproduced, and a video signal B is outputted by actuation contrary to the time of record. The conversion information stored in the predetermined location is also separated and outputted to coincidence. When being set up using the actuation information from the actuation information input

terminal 106 at this time so that it may be outputted from an output terminal 108 in the same 24Hz as the image pick-up rate at the time of record, the actuation controller 107 is controlled based on the rate information in conversion information (m) to perform playback according the information playback by the regenerator 105 to x (24/60) (1/m) **** special playback mode. The frame rate of the playback video signal outputted from a regenerator 105 becomes what has the wave conceptual diagram (drawing 4 (d)) of the playback video signal B acquired at this time and the wave conceptual diagram (drawing 4 (b)) of the video signal B at the time of record completely the same m=2 / 5 cases although it is always 60Hz. Moreover, the repeat flag in the playback conversion information taken out by coincidence is shown in drawing 4 (e).

[0047] In the playback rate converter 202, two frames is chosen and outputted out of five frames to the playback video signal B shown in inputted drawing 4 (d). Time-axis elongation is carried out and only the frame of the beginning after the point that the value of the repeat flag specifically shown in drawing 4 (e) inputted into coincidence changes is changed into a 24Hz video signal, as shown in drawing 4 (f), and it is outputted to an output terminal 108. In the case of the gestalt of this operation, drawing 4 (a) and (f) become the same video signal of 24P.

[0048] Next, the case where record and carry out 4/5X slow playback of the

frame rate 30Hz video signal, and slow motion image work of frame rate 24Hz is performed is explained using drawing 5 . Drawing 5 is the record of the video-signal record regenerative apparatus of the gestalt of this operation at the time of high-speed photography, a playback video-signal wave, and a conversion information wave conceptual diagram.

[0049] Rate information from the rate information input terminal 102 is first set to m=1/2, and as shown in drawing 5 (a), it picturizes with the mX frame rate image pick-up vessel 101 by 60x1 / 2= 30Hz frame rate. Next, by the record rate converter 201 From the value of rate information (m=1/2), like the case of the gestalt 1 of the operation inputted into coincidence, from the value of 1/(1/2) =2 Each frame of the video signal A inputted into the record rate converter 201 can be repeated twice, and the changed frame rate 60Hz video signal B (drawing 5 (b)) can be acquired with outputting one frame by the frame rate for 1 / 60 seconds. And further, a recorder 103 changes what was made into conversion information in accordance with the rate information m and a repeat flag (drawing 5 (c)) in the video signal B and the record rate converter 201 from the record rate converter 201 into the recording information for recording on a record medium 104 as well as the case of the gestalt 1 of operation, and carries out sequential record after that at a record medium 104.

[0050] At the time of playback, the information recorded on the record medium

104 by the regenerator 105 is reproduced, and the playback video signal B is outputted by actuation contrary to the time of record. The conversion information stored in the predetermined location is also separated and outputted to coincidence. Since the rate information in the reproduced conversion information is m=1/2 when being set up at this time so that it may be outputted from an output terminal 108 in the signal format that a frame rate is 24Hz by the actuation information from the actuation information input terminal 106, the actuation controller 107 is controlled to carry out special playback of the information playback by the regenerator 105, and to output it by x(1/m) =4 / 5X, first (2/5).

[0051] When a regenerator 105 outputs 4/5X slow playback in a frame rate 60Hz signal format, there are approaches, such as supposing no period outputting for one frame by carrying out the intermittent feed of the magnetic tape with a regenerator 105 etc., after outputting the video signal of 1 / 1 per 60 seconds, going and outputting four frames. The playback video-signal B output wave by this approach is shown in drawing 5 (d). Moreover, the repeat flag in the playback conversion information taken out in accordance with it is shown in drawing 5 (e). In the playback rate converter 202, if time-axis elongation only of the frame of the beginning after the point that the value of the repeat flag shown in drawing 5 (e) inputted into coincidence changes is carried out to the playback

video signal B shown in inputted drawing 5 (d) as shown in drawing 5 (f), the video signal of a 24Hz frame rate will be acquired, and it will be outputted to an output terminal 108.

[0052] By the above actuation, the video signal of a 30Hz frame rate will be extended and outputted to a 24Hz frame rate, and a 4/5X slow motion image can be acquired.

[0053] In addition, in the gestalt of this operation, although it explained taking the case of the case where perform intermittent playback in the regenerator 105 at the time of playback, and the signal wave form of drawing 5 (d) is acquired when acquiring a slow motion image, a front frame may be repeated and outputted at the time of the intermittent timing for 1 / 60 seconds. Furthermore, as long as it is the output timing of the playback video signal B that it inputs the frame of a playback video signal to the timing which the playback rate converter 202 needs, you may be what kind of thing. For example, there is a method of acquiring required information within a predetermined period etc. by carrying out non tracking playback of the record medium 104 with a regenerator 105.

[0054] Next, the case where record a frame rate 20Hz video signal, carry out 6/5X high-speed playback, and high speed motion image work of frame rate 24Hz is performed is explained using drawing 6 . Drawing 6 is the record of the video-signal record regenerative apparatus of the gestalt of this operation,

playback video-signal wave, and conversion information wave conceptual diagram at the time of high speed motion photography.

[0055] First, rate information from the rate information input terminal 102 is set to m=1/3. As shown in drawing 6 (a), it picturizes with the mX frame rate image pick-up vessel 101 by 60x1 / 3= 20Hz frame rate. Next, by the record rate converter 201 From the value of the rate information (m=1/3) inputted into coincidence, obtain 1/(1/3) =3, and as shown in drawing 6 (b), one frame is repeated for the video signal A inputted into the record rate converter 201 3 times. With outputting by the frame rate for 1 / 60 seconds, the frame rate 60Hz video signal B (drawing 6 (b)) can be acquired. In the video signal B of drawing 6 (b), the repeat flag wave which is the conversion flag which shows the location where the contents of a video signal of order changed by inter-frame [of the image frame outputted continuously] is shown in drawing 6 (c). And further, a recorder 103 changes what was made into conversion information in accordance with rate information (m) and a repeat flag (drawing 6 (c)) in the video signal B and the record rate converter 201 from the record rate converter 201 into the recording information for recording on a record medium 104, and carries out sequential record after that at a record medium 104.

[0056] At the time of playback, the information recorded on the record medium 104 by the regenerator 105 is reproduced, and the playback video signal B is

outputted by actuation contrary to the time of record. The conversion information stored in the predetermined location is also separated and outputted to coincidence. When being set up at this time so that it may be outputted from an output terminal 108 in the signal format that a frame rate is 24Hz by the actuation information from the actuation information input terminal 106, since the rate information in playback conversion information is m=1/3, the actuation controller 107 is controlled to carry out special playback of the information playback by the regenerator 105, and to output it by x(1/m) =6 / 5X, first (2/5).

[0057] While the regenerator 105 has been the frame rate output which is 60Hz, when performing special playback by 6/5X, by repeating a rapid feed and an intermittent feed for a magnetic tape with a regenerator 105 etc., after outputting the video signal of 1 / 1 per 60 seconds, going and outputting five frames, one frame is thrown away, and there is the approach of outputting the following frame immediately after that. The playback video-signal B output wave conceptual diagram by this approach is shown in drawing 6 (d). Moreover, the repeat flag in the playback conversion information taken out in accordance with it is shown in drawing 6 (e). In the playback rate converter 202, if time-axis elongation only of the frame of the beginning after the point that the value of the repeat flag shown in drawing 6 (e) inputted into coincidence changes is carried out to the playback video signal B shown in inputted drawing 6 (d) as shown in

drawing 6 (f), the video signal of a 24Hz frame rate will be acquired, and it will be outputted to an output terminal 108.

[0058] By the above actuation, the video signal of a 20Hz frame rate will be contracted and outputted to a 24Hz frame rate, and a 6/5X high speed motion image can be acquired.

[0059] In addition, as long as it is the output timing into which the frame of a playback video signal is inputted to the timing which the playback rate converter 202 needs in the gestalt of this operation although explained taking the case of the case where reproduce by fast forwarding a tape in the regenerator 105 at the time of playback, and the signal wave form of drawing 6 (d) is acquired when acquiring a high speed motion motion image, you may be what kind of thing. For example, there is a method of acquiring required information within a predetermined period etc. by carrying out non tracking playback of the record medium 104 with a regenerator 105.

[0060] As explained above, according to the gestalt of this operation, the repeat flag which is a conversion flag, and rate information which sets up the frame rate of an image pick-up machine are made into conversion information. Record with a video signal and playback conversion information is acquired to a playback video signal and coincidence at the time of playback. A reproduction speed setup [in / automatically / by playback conversion information / a regenerator

105], A rate conversion ratio setup in the playback rate converter 202 can be performed, it is not necessary to perform a fine setup of the regenerator 105 by the manual, or the playback rate converter 202, and the video signal changed into the desired rate can be acquired.

[0061] Moreover, the frame rate of the mX frame rate image pick-up machine 101 at the time of record can be set as a free value, on the other hand, since it is automatically changed and outputted to predetermined reproduction speed, the implementation speed range of slow motion or a high speed motion is wide at the time of playback, and employment is also simple [the time].

[0062] In addition, although the gestalt of this operation explained the case where the image of a standard frame rate, a 4/5X slow motion image, and a 6/5X high speed motion image were acquired, it can realize easily, without performing a fine manual setup with the same procedure also with the case of other speed.

[0063] Moreover, although carried out to the m itself which shows the rate of an image pick-up frame rate [as opposed to the frame rate at the time of record playback for rate information], the relative frequency relation to the frame rate at the time of record playback may be shown.

[0064] Moreover, as long as the repeat flag of conversion information is the sign which the point that the contents of the video signal change by inter-frame understands, what kind of value is sufficient as it.

[0065] Moreover, although the repeat flag was used as one of the conversion information, the same effectiveness is acquired even if it is the effective flag which shows the effective location of only one frame of the contents frames of the same video signal currently put in order repeatedly.

[0066] Moreover, although it was described as the same location as the gestalt 1 of operation of the location which stores conversion information of this invention, as long as it is the location which can be taken out to a video signal and coincidence at the time of playback, you may store anywhere.

[0067] Moreover, in the gestalt of this operation, although only the case where playback was outputted in 24Hz was explained, it is also easy to output, for example by making 24P video signal into a 60Hz signal format as shown in drawing 4 (b).

[0068] Moreover, although the recorder 103 in the gestalt of this operation shall record the video signal of a frame rate 60Hz signal format by standard speed, it may be the other frame rate.

[0069] (Gestalt 3 of operation) Drawing 7 is the block diagram showing the configuration of the video-signal record regenerative apparatus with which one example of the video-signal recording device of invention of this application 3rd and one example of the video-signal regenerative apparatus of invention of this application 5th were combined. In drawing 7, the same sign is given to the block

which performs the same actuation as the video-signal recording apparatus and video-signal regenerative apparatus in the gestalt 2 of operation, and explanation is omitted.

[0070] In drawing 7 , 301 is a rate information detector which detects the value of the rate information set up at the time of record from the contents of a repeat flag which are the conversion information acquired from a regenerator 105.

[0071] About the video-signal record regenerative apparatus constituted as mentioned above, the actuation is explained below.

[0072] The gestalt of this operation explains the case where the frame rate of a record format is 24Hz, as a standard frame rate. A video-signal format is made into the progressive video-signal format which makes one frame the unit of record and a display. Furthermore, a recorder 103 is changed and recorded on frame rate 60Hz by the record rate converter 201, when not recording the video signal of a frame rate 60Hz signal format by standard speed and recording the input signal whose frame rate is not 60Hz. Moreover, about the part which performs record and playback, VTR which carries out the helical scan of the record reproducing head, and carries out information record on a magnetic tape is assumed.

[0073] Although it is the same procedure as the gestalt 2 of operation described the actuation by the side of record, let the conversion information outputted from

a record rate converter 201 be only the repeat flag which is the conversion flag which shows the location where the contents of a video signal of order changed by inter-frame [of the image frame outputted continuously] in the gestalt of this operation in the video signal B outputted from a record rate converter 201 to coincidence.

[0074] The record reproducing head and a magnetic tape feed rate are first turned on a playback side at standard speed (60Hz, 1X playback), with a regenerator 105, recording information is reproduced from a record medium 104, and the playback video signal B and conversion information are acquired. Although the contents of conversion information are only repeat flags in the gestalt of this operation, the repeat flag is inputted into the rate information detector 301.

[0075] In the rate information detector 301, the value of the rate information set up from the inputted contents of a repeat flag at the time of record is detected. If the frame number of the playback video signal B in a cycle of [in 1 period around which the repeat of the temporal response of the inputted repeat flag goes] 60Hz is set to alpha and the total number of the change of state (1, 0, 1, 0, --) of the repeat flag in the inside of 1 period of a repeat flag is further set to beta, the rate information m at the time of record can calculate in advance by count of m=beta/alpha.

[0076] For example, when a repeat flag is drawing 4 (c) in the playback video signal B outputted by 60Hz, alpha= 5 (five frames (F1, F1, F1, F2, and F2)), beta= 2 (by repeat flag =0 at the time of repeat flag =1 and F2 at the time of F1) It is detectable to have set it to m=2 / 5 (for it to picturize in frame rate 24Hz) in the mX frame rate image pick-up machine 101, since the change of state was 2. Moreover, when a repeat flag is drawing 5 (c), it can detect having been referred to as m=1 / 2 (it picturizing in a frame rate 60x1 / 2= 30Hz) in the mX frame rate image pick-up machine 101 from = (alpha, beta) (4 2). Moreover, when a repeat flag is drawing 6 (c), it can detect having been referred to as m=1 / 3 (it picturizing in a frame rate 60x1 / 3= 20Hz) in the mX frame rate image pick-up machine 101 from = (alpha, beta) (6 2).

[0077] The same is said of the case of other frame rates. Record of the video-signal record regenerative apparatus of the gestalt of this operation, a playback video-signal wave, and a conversion information wave conceptual diagram are shown in drawing 8 . For example, when it is the relation of the playback video signal B and a repeat flag as shown in drawing 8 (a), From = (20 6), it is detectable to have picturized in m=3 / 10 [60x3], i.e., a frame rate, / 10= 18Hz. (alpha, beta) When it is the relation of the playback video signal B and a repeat flag as shown in drawing 8 (b), From = (3 2), it is detectable to have picturized in m=2 / 3 [60x2], i.e., a frame rate, / 3= 40Hz. (alpha, beta) When it

is the relation of the playback video signal B and a repeat flag as furthermore shown in drawing 8 (c), it can detect having picturized in m=4 / 15 [60x4], i.e., a frame rate, / 15= 16Hz from = (alpha, beta) (15 4).

[0078] The rate information detected with the rate information detector 301 is inputted into the actuation controller 107 and the playback rate converter 202 with the repeat flag which is conversion information. When being set up so that it may be outputted from an output terminal 108 in the signal format that a frame rate is 24Hz by the actuation information from the actuation information input terminal 106, at this time, control of the subsequent regenerators 105 and the playback rate converter 202 is performed by the procedure explained with the gestalt 2 of operation, and the same procedure, and a slow motion image or a high speed motion image can be acquired in playback frame rate 24Hz.

[0079] As explained above, according to the gestalt of this operation, the repeat flag which is a conversion flag is made into conversion information. Record with a video signal and playback conversion information is acquired to a playback video signal and coincidence at the time of playback. The rate information detector 301 detects rate information from playback conversion information. A reproduction speed setup in a regenerator 105 and a rate conversion ratio setup in the playback rate converter 202 can be performed automatically, it is not necessary to perform a fine setup of the regenerator 105 by the manual, or the

playback rate converter 202, and the video signal changed into the desired rate can be acquired.

[0080] Moreover, the frame rate of the mX frame rate image pick-up machine 101 at the time of record can be set as a free value, on the other hand, since it is automatically changed and outputted to predetermined reproduction speed, the implementation speed range of slow motion or a high speed motion is wide at the time of playback, and employment is also simple [the time].

[0081] Furthermore, as compared with the case of the gestalt 2 of operation, there is no need of recording rate information as conversion information at the time of record, and the recording information to a record-medium 104 top can be reduced.

[0082] In addition, also in the gestalt of this operation, it can realize easily, without performing a fine manual setup with the same procedure also with the case of the slow motion rate except the gestalt 2 of operation having explained, or a high speed motion rate.

[0083] Moreover, although reference was not made about the location which stores conversion information, the storing location in the gestalt 1 of operation of this invention and the same location are sufficient, and as long as it is the location which can be further taken out to a video signal and coincidence at the time of playback, you may store anywhere.

[0084] Moreover, as long as the repeat flag of conversion information is the sign which the point that the contents of the video signal change by inter-frame understands, what kind of value is sufficient as it.

[0085] Moreover, although conversion information was made into the repeat flag, the same effectiveness is acquired even if it is the effective flag which shows the location of only the effective frame of the contents frames of the same video signal currently put in order repeatedly.

[0086] Moreover, in the gestalt of this operation, although only the case where it outputted in 24Hz from an output terminal 108 was explained, it is also easy to output, for example by making 24P video signal into a 60Hz signal format as shown in drawing 4 (b).

[0087] Moreover, although the recorder 103 in the gestalt of this operation shall record the video signal of a frame rate 60Hz signal format by standard speed, it may be the other frame rate.

[0088] Moreover, although explained supposing VTR which uses a record medium 104 as a magnetic tape, carries the record reproducing head on a rotating cylinder with a recorder 103 and a regenerator 105 in the gestalten 1, 2, and 3 of operation, carries out the helical scan of the record reproducing head, and records information on a magnetic tape Even if it is the disk unit which consists of nonlinear equipment with which the record medium containing the

record reproducing head consists of a hard disk, or an optical disk, as long as it can adjust the timing of record and playback from the outside, you may be what kind of thing.

[0089]

[Effect of the Invention] As mentioned above, according to this invention, conversion information is united with the video signal of the various frame rates obtained with an image pick-up vessel, record playback is carried out, and a playback video signal can be easily set automatically in a predetermined playback frame rate by using playback conversion information at the time of playback.

[0090] Moreover, in the case of VTR, what has set up the playback frame rate only with the special reproduction speed control range which can be set up with a jog dial, and the regular special reproduction speed can set up now freely more, and the effectiveness is conventionally large.

[0091] Furthermore, this invention can be carried out easily that conversion information is stored in the already prepared sub-code area etc. in the case of DV etc., and should just carry out record playback.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The block diagram of the video-signal record regenerative apparatus in the gestalt 1 of operation of this invention

[Drawing 2] Record of this video-signal record regenerative apparatus, and a playback video-signal wave conceptual diagram

[Drawing 3] The block diagram of the video-signal record regenerative apparatus in the gestalt 2 of operation of this invention

[Drawing 4] The record of a video-signal record regenerative apparatus at the time of this usual frame rate photography, a playback video-signal wave, and a conversion information wave conceptual diagram

[Drawing 5] The record of a video-signal record regenerative apparatus at the time of this high-speed photography, a playback video-signal wave, and a conversion information wave conceptual diagram

[Drawing 6] The record of a video-signal record regenerative apparatus at the time of this high speed motion photography, a playback video-signal wave, and a conversion information wave conceptual diagram

[Drawing 7] The block diagram of the video-signal record regenerative apparatus in the gestalt 3 of operation of this invention

[Drawing 8] Record of this video-signal record regenerative apparatus, a playback video-signal wave, and a conversion information wave conceptual diagram

[Drawing 9] The block diagram of the conventional video-signal record regenerative apparatus

[Drawing 10] Record of the conventional video-signal record regenerative apparatus, and a playback video-signal wave conceptual diagram

[Description of Notations]

101 MX Frame Rate Image Pick-up Machine

102 Rate Information Input Terminal

103 Recorder

104 Record Medium

105 Regenerator

106 Actuation Information Input Terminal

107 Actuation Controller

108 Output Terminal

201 Record Rate Converter

202 Playback Rate Converter

301 Rate Information Detector